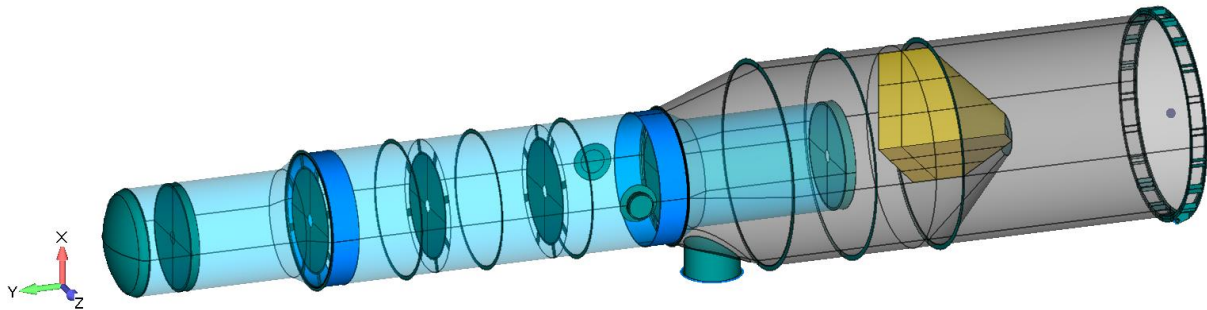


Keywords: Femap, NX Nastran, ASME, Section VIII, Div. 2, code analysis, membrane stress, pressure vessel, heat exchanger, evaporator, condenser, schnabel, saddle supports, nozzle, repad, stainless steel, dead weight loading, transportation analysis, static analysis, stress analysis.

Main Graphic:



Caption: ASME Section VIII Pressure Vessel - Transportation Analysis.

Case Study Section: Stress and Deflection**ASME Section VIII, Division 2 Pressure Vessel - Transportation Analysis****Analysis Type:** Static, Stress, ASME Section VIII Div. 2

The design of ASME Section VIII pressure vessels is generally guided by the code and FEA is not always necessary. However, with non-standard geometry, multiple construction materials and additional weight added after fabrication, analysis is frequently used to solve problems not addressed in the ASME code.

The pressure vessel in this analysis was a large shell-and-tube heat exchanger analyzed under transportation conditions. The heat exchanger was idealized with a combination of plate and beam elements as shown in Figure 1. One end of the vessel was supported with a schnabel and the other end was supported with a saddle (see Figures 2 and 3).

Once the static stress analysis was performed, the results were interrogated to ensure that the stresses did not exceed the ASME allowables (P_L , P_M for membrane stress and P_L+P_B+Q for surface stress).

This analysis was used to demonstrate that the vessel, with the additional weight of insulation, would meet the ASME Section VIII requirements during transportation with no design modifications.

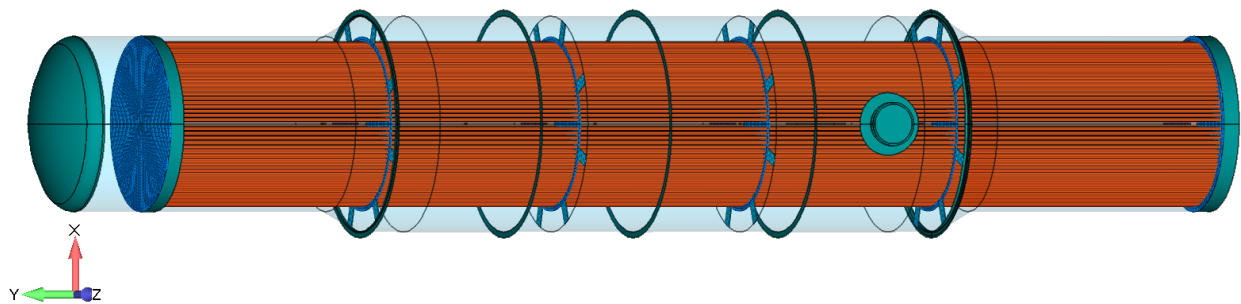


Figure 1: The tubes of this shell-and-tube heat exchanger were modeled with beam elements.



Figure 2: Examples of pressure vessels in transportation. The upper images shows a vessel attached to a schenkel train car. The vessel in the lower image is mounted in saddle supports atop multiple flatbed trailers.

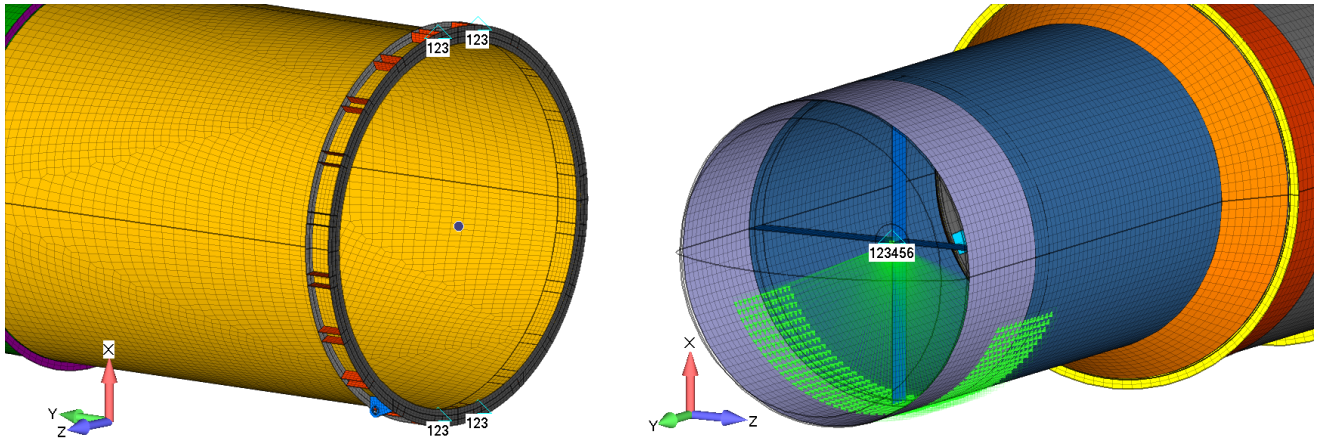


Figure 3: The schnabel and saddle support were idealized in the FE model with Single Point Constraints (SPCs) and Rigid Body Elements (RBEs).

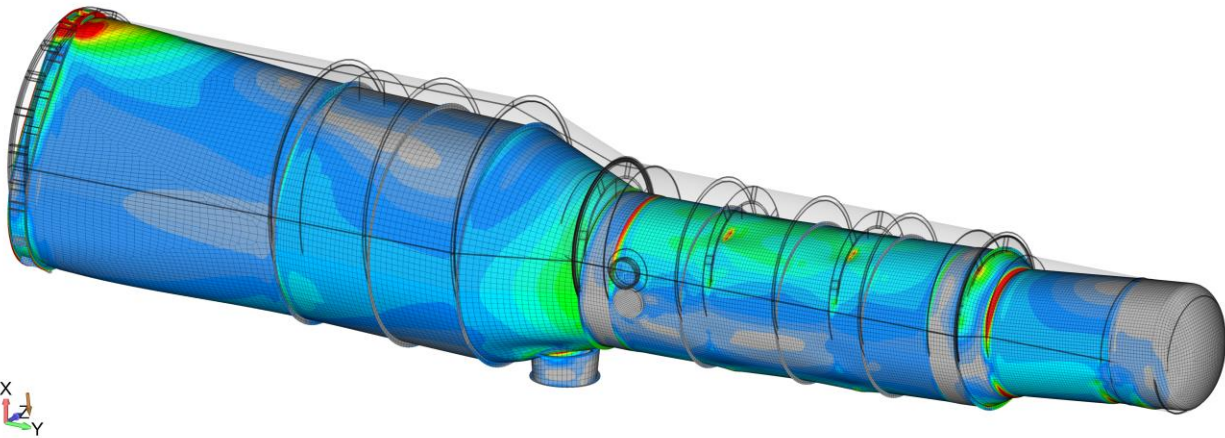


Figure 4: The vessel is shown with stress contours and extreme exaggerated deformation. The undeformed model is shown in transparent gray.